APPLN. FILING DATE: JANUARY 5, 2004
TITLE: NUCLEIC ACID IMMUNIZATION
INVENTOR(s): CONNIE S. SCHMALJOHN ET AL.
APPLN. SERIAL NO.: 10/751,103 SHEET 1 OF 17



ಹ Φ ർ TAT ಹ Leu 40 ർ TTT ATG Met Phe UNTITLED2 Phe 30 Phe Lys OF TRANSLATION TAT TyrACA 20 *** ർ TAT ൯ Phe 0 ൯ CILLeu ATC Ile සු

2605

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Range:

Sequence

TAT

50

Ile> ൯ Phe ಹ Len 90 ൯ $_{
m LCI}$ Ser ៧ TTA Len *** TAA UNTITLED2 AAA Lys 80 Asn AAT LysAAA ОF TRANSLATION GCC Ala 70 LysAAA ಹ GTT Val 9 ಹ $_{
m LCL}$ Ser Q AAA AGT Ser Lys

Ile> ATT ർ TAA *** ൯ ATA Φ ൯ ATA Ile ൯ AAT Asn TIC Phe 130 UNTITLED2 Asn AAT IlePhe OF. 120 TRANSLATION LysAAG Len Lys AAA ൯ Leu 110 ർ ATA Φ ಹ ATT Φ ർ TAT

FIG 1A

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APPLN. SERIAL NO.: 10/751,103 SHEET 2 OF 17 Leu> Gly Asn> Glu Asn Arg Leu Leu Asn> AAA AAA CGA AAA GTG TTA 290 TCA AGC ACA GGT AAT GAG AAC CGG TTA TTA AAT 240 ៧ ൯ ಹ Lys Lys Arg Lys Val ൯ Thr ൯ ർ Ser 280 Signal peptide ಹ ಥ α Ser 230 Ø GTT Val UNTITLED2 UNTITLED2 UNTITLED2 Leu ATG Met CAG Gln 270

Ile

 Thr

Leu

Ala

Leu Met

Pro

Insert

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TRANSLATION

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ATA

ACG

 $_{
m LCI}$ Ser

GCA

TTA ATG

CCA

ATA Ile

220

210

200

190

180

ATG

170

160

150

TAT Tyr

 Thr

Arg

Thr Lys Arg

Tyr

Phe

TRANSLATION OF

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TAA TIT TAT ACA AAA AGG AGA ACG

PA Start

Lys

Val

Gln Ala

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TRANSLATION

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AAA

GTT

GAA

GCA

CAG

ATT Ile

GIG

GAG

Val

Glu

Leu

sedneuce

signal

Mature PA

end PA

250

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Ser> Ser Asp> Thr Gly Asp> Gln> TTT AGT GAT ACC TCT TCT ACT ACA GGG GAT CCA TCG GAA AAC CAA GTT AAG AAG AGT 480 ಹ Γys Ser Glu Asn 430 α Lys Phe 380 330 ൯ TAT Tyr Thr Val ៧ Ser ൯ ಹ TyrLys GGA TAC Pro ATC AAA 420 Gly ' Ile ATT Ile Ser 370 Ø UNTITLED2 CTA Len GAA AAT \mathtt{Thr} Asn Gly Phe 320 a TRANSLATION OF UNTITLED2 Glu Gly Leu Val TGG TCA GGA 460 999 TRANSLATION OF Glu Leu Trp Ser GTG TTA OF TRANSLATION OF 410 Val 360 TRANSLATION ATG CAG Gln GAG Pro Met TCC ICI Ser Ser 450 Ala Ala AGT GCA Ser TCT ATT CCT AGT Ser 400 ൯ ൯ ൯ GAA TCA GAA TCA Gln Pro Ser Ser CAA 350 300 ៧ Q ൯ Ile CAA Glu TTG AAT TTT Phe Gln ൯ ൯ ർ Ser Ser Phe Leu Asn TTT440 390 ൯ ൯ \mathtt{TTA} Leu Glu TAT Tyr 340

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530	*	TGG	\			ATC	Lys Ala Ser Asn Ser Asn Lys Ile>	^		*	CGA	Gln Ile Lys Ile Gln Tyr Gln Arg>	^			GAT
	*	GCT GAT AAT CAT GTA ACA ATG TGG	Ala Asp Asn His Val Thr Met Trp> UNTITLED2 [A] a a a >		*	AAA GCT TCT AAT TCT AAC AAA ATC	Lys	р В			CAA ATA AAA ATT CAA TAT CAA CGA	Gln	מ	670	*	CCT ACT GAA AAA GGA TTG GAT TTC AAG TTG TAC TGG ACC GAT
		ACA	, ה ה	570	*	AAC	Asn	Ф	620	*	\mathtt{TAT}	Tyr	.о М			$^{\mathrm{TGG}}$
520	*	GTA	ָ , מ	2		TCT	Ser	ď		*	CAA	Gln	ಹ		*	TAC
		CAT	A]		*	AAT	Asn				ATT	Ile		099	*	TTG
	*	AAT	UNTITLED2 [A]			TCT	Ser	UNTITLED2 [A]	610	*	AAA	Lys	UNTITLED2 [A]	9		AAG
510	*	GAT	ITLE	560	*	GCT	Ala	ITLE			ATA	Ile	ITLE		*	TIC
					*	AAA				*						GAT
	*	TCC	N OF			AAT	Asn	N OF	009	*	TAT	Tyr	N OF	650	*	TTG
		TIT GCT ACT ICC Phe Ala Thr Ser	ATIO	550	*	ATT	Ile	a TRANSLATION OF	9		TTA	Leu	ATIO		*	GGA
200	*	GCT	ANSL			GTG	Val	ANSL		*	AGA	Arg	ANSL			AAA
	*	TTT.	a TRANSLATION OF		*	GAC CAA GAA GTG ATT AAT	Asp Gln Glu Val Ile Asn	a TR			GAA AAA GGA AGA TTA TAT	Glu Lys Gly Arg Leu Tyr	a TRANSLATION OF	640	*	GAA
		TAT ACA	ر ا	540	*	CAA	Gln	ಹ	590	*	AAA	Lys	ರ			ACT
490	*		_	Ŋ		GAC	Asp	ď		*			ಡ		*	
		GAT GAA	: (ਹ	*	GTA GAT	Asp	ಹ			TTA	Arg Leu	ď	630	*	GAA AAT	
	*	GAT) }			GTA	Val		580	*	AGA	Arg		9		GAA

Trp Thr Asp>

Glu Lys Gly Leu Asp Phe Lys Leu Tyr

TRANSLATION OF

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Thr

Glu Asn Pro

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Ser> Asn Leu Gln Leu Pro> Ser> CAA TTG CCA 770 GAT TCA TTTTCA AGA AAA AAG CGA AGT ACA AGT 720 ർ ಹ AAA AAT AAA AGA ACT Pro Asp Arg Lys Lys Arg Ser Thr ർ ൯ CCI 860 810 ಹ ൯ ď Ile GAT AAC TTA GAT GGA ATC 760 ಹ ൯ Gly710 Asp Asp 850 UNTITLED2 UNTITLED2 UNTITLED2 Asn , GIC AGT Ser AAT 800 750 Ser GAC Asp GAT TCT Ser 700 Arg Asn TCG AAC CCA GAC CGT TRANSLATION OF GTT QF. TRANSLATION OF 840 TRANSLATION Ser GIG Pro Asp ACG Val 790 Glu Ser ICI \mathtt{TAT} GAA 740 069 LysLysGIICAA AAT AAA AAA GAA TTA AAA CAA AAA Val GGA ൯ ൯ ൯ LysGln Thr GGA CCT ACG GAA 830 780 ൯ ൯ ൯ Asn LysPro GAG GTA 730 ൯ ൯ ൯ G1yLen Gln 680 ಹ Glu ൯ GCT Ala TTA $_{
m LCL}$ Ser

FIG 1E

Phe>

 Thr

Val Lys Asn Lys Arg

Asp

Val

 Thr

Gly

Glu

Val

Glu

Len

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UNTITLED2 [A]

OF.

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Glu> Lys> Ser> GAG GGA TTA ACC AAA 1010 GAT CCG TAC AGT 960 ൯ ಹ Gly Leu Thr Pro Asp Pro Tyr CCA 910 TCASer 1050 ൯ ಹ AAG AAT GTA Val 1000 Ser ൯ $_{
m LCI}$ Lys Asn Glu Lys Lys AAG AAA 950 900 GCT Ala UNTITLED2 UNTITLED2 GAA Thr , Asp GAT ACG 1040 990 TGG AGC Ser Ile CAT His 940 Trp Arg CGG Q ОF O F 890 TRANSLATION TRANSLATION TRANSLATION Asn Lys GGA AAA GlyAAT 1030 Ser Glu GAA Thr ACA 980 930 Pro Ile ATT GTT Val 880 ൯ ಹ ൯ CCA TGG Trp Ser GAT TTC GAA AAG Glu Lys TCA TCT 1020 ൯ ർ ർ Pro Ser 970 ಥ TCA AAA Ser LysAsp Phe 920 870 ಹ TAT Leu Tyr

Asp Met>

His

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UNTITLED2

OF

TRANSLATION

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Leu Val

Pro

His

Ala Arg

CCG

 Tyr

GAT ATG

GTA Val

CAT

GTA Val

ATT Ile

TAT

GCT Ala

GCA Ala

CTT GTG

GCA AGA CAC CCC

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INVENTOR(S): CONNIE S. SCHMALJOHN ET AL.
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 Thr $\operatorname{Thr}>$ Ser> Phe> ACA AGT AGG ACA TTT1250 CAA TCC ACA CAG AAT ACT TCA AGT 1200 ಹ ൯ Ser Arg $_{
m LLC}$ Phe Gln Asn Ser 1150 1241 Exon ಹ ൯ CAT GCG TCG AGT AAT TCG AAT Ser Asn 1100 ಡ ൯ ಹ Thr Thr Ser Ala 1240 ಥ ൯ ൯ ർ Ser His AAA AAT ACT TCT Ser Asn 1190 1140 Z [A] GIG Gln Thr Ser Val 1090 UNTITLED2 UNTITLED2 UNTITLED2 Glu GAT Asp Asn GAA 1230 Glu Lys GAG GCA Ala GGA Gly 1180 Asn Ser GAA ACG AGA ACA ATA AGT Lys Asn 1130 GGA AAT OF AAA AAT Ala TRANSLATION OF TRANSLATION OF TRANSLATION OF 1080 TRANSLATION $_{
m LCI}$ Ile GlySer TCA Thr Ser His GTA CAT Val 1220 1170 CICLeu Ser Thr Arg GGT GGG AGT Val GTA 1120 ൯ ಹ ൯ ൯ ATT GlyIle Glu GAA 1070 ಹ ൯ ಡ ಡ Glu GAG AAT ATT Ile ACT AGT Ser Gly1210 ൯ ಥ ർ Ծ Asn GAT AGT Ser Thr GAT ATT Ile 1160 1110 ർ ൯ Asp Asp CAT Glu His 1060

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Trp> Thr Ala Arg Leu Asn Ala> Leu> TTA GCA GGG GAA AGA ACT TGG GCT GAT ACA GCA AGA TTA AAT GCC 1440 ൯ ៧ TAC AAC GTG Thr Val 1390 Glu Arg Tyr Asn 1340 1290 ൯ ಹ G1yCCA ATC Pro Ile 1430 1380 UNTITLED2 [A] Leu Ala 1330 UNTITLED2 UNTITLED2 CTA Ala Asp ACG GCT 1280 Ser Thr $_{
m LCI}$ 1420 Leu CTA $_{
m Gly}$ Thr TRANSLATION OF GTA AAT ACT GGG TTA AAT ACC TRANSLATION OF 1370 Q 1320 TRANSLATION Ser TCA Gly Leu Asn Thr 1270 Asn His CAT 1410 Asp Val GAT GAA ACA ATG GGT 1360 α ൯ ർ Tyr Ile ACG GTC GCA ATT Thr Met AAT ATT AGA TAT 1310 1260 ಹ ಹ ಹ Arg Ala ಹ ർ ಡ Glu Ile Val 1400 1350 ൯ Asn Thr GCT Ala 1300

FIG 1H

Ile>

 \mathtt{Thr}

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TTA GGA AAA AAT CAA ACA CTC GCG ACA ATT

GTG

CCA ACG ACT TCG

Leu Val Leu Gly Lys Asn Gln Thr Leu Ala

UNTITLED2 [A]

TRANSLATION OF

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Ser

 Thr

 \mathtt{Thr}

Pro

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Tyr>Gln Asp Asp> Glu Leu> 1490 TAT GCA CAA GAC GAT CTT GAG TTA ಹ CTT GCA CCT AAT AAT Pro Asn Asn 1630 α Leu 1580 1530 ൯ ៧ Phe Ala TAC AAT CAA TTT 1480 Gln TTA AAT Leu Asn Leu Ala 1620 UNTITLED2 [A] UNTITLED2 [A] Tyr Asn 1570 UNTITLED2 Ala Ile ATA GCA 1520 1470 CAA Gln Ile ATC AAT Asn CCA Pro ACA ATG TRANSLATION OF Met TTA AGT Ser 1610 TRANSLATION OF TRANSLATION OF 1560 gad Ala Thr Glu Asn Gln Leu 1510 AAG GAA AAC CAA Asn Leu Ile TIG CCA ATT 1460 AAC Pro 1600 ൯ ൯ ൯ CCT TCT AAA Lys Thr TCT ACT 1550 1500 ಹ ർ ൯ LysSer Ser 1450 ಡ ൯ AGT AAA GCT Lys Ala Pro Ser 1590 ർ TAT TIC Phe Tyr 1540

Gly Asn>

 Tyr

Val

Gln

Asp

 Thr

Len

Gln

Lys

 Thr

Glu Lys

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UNTITLED2

OF

TRANSLATION

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GTA TAT GGG AAT

GAT CAA

ACG

GAT Asp

TTA

TTA AGA Leu Arg

CAA

GAA AAA ACG AAA

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G1y>Ala> Thr Thr Ala Arg> 1730 CGI GGA AGA GTG AGG GTG GAT ACA GGC CTG GTA GAA AGG CGG ATA GCG GAA ACG ACT AAA CCG GAT ATG ACA 1680 ൯ CAA GAA ACA ACT GCA Thr Ile ൯ Val Asp Glu Arg Arg 1820 1770 ൯ ൯ ಹ 1720 1670 Arg ' ಹ Gln Glu UNTITLED2 [A] UNTITLED2 [A] Val Leu Val 1810 UNTITLED2 Arg Ile CAA ATT 1760 1710 AAT Asn Gly Gln 1660 TTA Leu CCG Pro TRANSLATION OF GAA AAT Glu Asn TRANSLATION OF TRANSLATION OF CCA TTA 1800 TTA Len Gly Lys Asp GGA AAA GAT 1750 GIG Phe GIT AAT CCT AGT GAT Glu Val 1700 1650 GAA Asn AAT ಹ ൯ ಹ TAC TCG AAC TGG AGT Ser \mathtt{Tyr} Asn TTT AAT 1790 1740 ർ ಹ ಡ GCA ACA Trp Phe Thr 1690 ൯ ൯ Ser Asn ATC ATT Ala Ile 1640 Q ಹ ಹ GCG ATA Ile Ile 1780

Thr>

Thr Lys Pro Asp Met

UNTITLED2 [A]

TRANSLATION OF

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Glu Thr

Leu

Pro

Asp

Ser

Pro

Asn

Val

Ala

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Gly>Phe> Leu Asn> GGA TIC TTA AAC 1970 1920 ൯ ർ Asn GAA CCG AAT GAT TTT AAT Glu Pro Asn 1870 Glu GAA Asp Phe ൯ ർ ռ GCG Gln Leu Ala 1960 ൯ α ፙ TTT AAC TTTAsn Glu Phe 1910 CAG TTA 1860 ⊴ Phe GAA UNTITLED2 UNTITLED2 AAT ACC Thr Asn GGA Gly 1950 AAG Lys ATA Ile Phe IND 1900 GAC Ala Lys Asp AAT ATC Ile 1850 OF GCA О F TRANSLATION OF TRANSLATION TRANSLATION AAA Ile Asn ATA Gly LysCAA Gln GGG AAA 1940 1890 Leu Gln $_{
m LCI}$ Ser CIICAA 1840 ಹ ൯ ൯ Ala TAT ${\rm Tyr}$ GAT CAA CAA ACA Thr GAA GCC ៧ ൯ ൯ CAA Glu Gln Gln 1930 ർ ർ ൯ TTA AAA LysLeu Gln 1880 1830 ಹ Asp ൯ TTA Asn Leu AAC

Lys Leu Asn Ala Lys>

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TTA AAT GCA AAA

AAA

ATC .

AAA

GAT

TTA

GTA Val

ACT

TAT Tyr

GCA ACT AAC ATA

Ile

Asp

Leu

 Thr

Ile

Asn

 Thr

Ala

UNTITLED2 Lys

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Glu> Glu> Tyr Asp Arg Asn Asn> Ile Asp Lys Asp> TAT GAT AGA AAT AAC GCT CAT AGA GAA TTA AAT ATT GAT AAG GAT 2210 GAA GAT ACT GAA 2160 ಹ Arg Thr 2110 His Glu Asp Ala] ಹ ಹ 2200 Q ൯ Ile AAG GAG Glu Leu Leu Asn GAA ATT 2150 2100 Ø UNTITLED2 [A] CAT Glu Lys His UNTITLED2 UNTITLED2 TTG Phe $_{
m GLL}$ Val Val GTA 2190 TTA Arg Gly Leu Ile CGI GTA Val 2140 Lys TCASer GAG GGA TAT 2090 Q F GAT AAA Q TRANSLATION OF TRANSLATION OF TRANSLATION TRANSLATION Asp GAG GGT Glu Glu Gly Arg Asp TTA ATA AGA GAT Thr Ser TCA ACA 2180 TCA 2130 GCG Ala Ile Ser Len 2080 ಹ ൯ ൯ ൯ G1yLen GTT GGG ATT AAT TCG Ile Ser ATA AGA AAA ATA ൯ ಡ ൯ ർ LysIle ATG AAT ATT Asn Val 2170 ಹ ಡ Arg GCA Asn Ala Ile 2120 2070 ൯ ൯ GTA ൯ Ile ATA Met Ile Val

2060

2050

2040

2030

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Val> Ser> Tyr Asn> GTA GGG GAT TIT AAA AAA TAT AAT 2400 ർ ಹ TTG AAT ATT TAT AAG GTA AAT Asn AAT CCT AGT GAG AAT Ile2350 ർ ಹ ൯ Lys Lys Asn Val 2300 2250 ൯ ൯ Leu Lys ಹ ಹ Phe TyrGAT ATG Met 2390 2340 Asp Asp Asn AAT 2290 UNTITLED2 UNTITLED2 UNTITLED2 Ile CCC Tyr \mathtt{TAT} Pro ATA 2240 Arg LLL AAT AGA Phe Asn ATT 2380 Asp GAC Ser OF Thr ОF 2330 ATA AGT ОF AAA ACA AAC ACT 2280 TRANSLATION TRANSLATION TRANSLATION AAT Lys Asn Ile 2230 G1yGGA GAA ATA Ile \mathtt{TAT} Tyr2370 Asp (TTA Leu TTA CGG CAA GAT GLI AAA Val 2320 ൯ ൯ ൯ Gln Pro ACT TTA CCG Glu AAA GAA 2270 2220 ಹ ൯ ൯ GLL Arg Len Lys ൯ ಥ GCT GGG CIT LysLeu Gly Leu GAT AAA 2360 2310 Asp ൯ AGT Ser TAT 2260

G1y>

Glu Asn

Ser

Pro

Asn

Ile

Ile

 Thr

Asn

Glu

Lys

 Thr

Val

Ala

Tyr

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UNTITLED2 [A]

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Glu>

Lys

Lys

Lys

Cys

Phe

 Thr

Lys

Ile

Lys

Ser

Asn

Lys

 $_{
m LCI}$ Ser

TAC

AAA ACA

AAA AAC AGT AAA ATT

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UNTITLED2

QF Tyr

TRANSLATION

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GAG

TGT AAG AAA TAC AAG

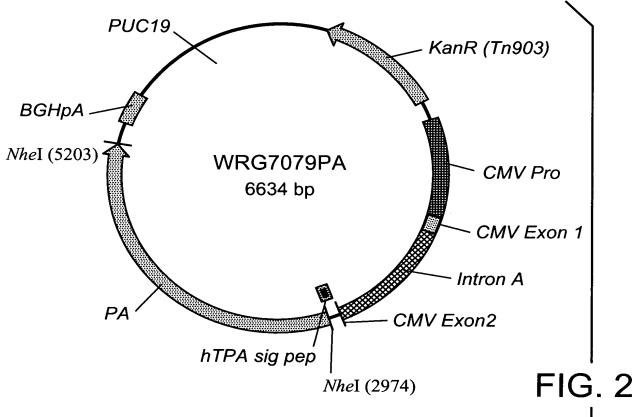
Leu> Lys> 2450 CTA TCT AAA AAA ൯ $\Gamma \lambda s$ TAT ൯ Ser TTA AAT Asn 2540 2490 ൯ Leu ൯ TTTPhe 2440 ൯ TLL TTA ATC Ile Phe Len TGA *** 2530 UNTITLED2 UNTITLED2 Ile AGG ATT Arg 2480 2430 Lys $_{
m LCI}$ Ser AAA ATC AAG TAA GGT AAT Asn TRANSLATION OF STOP codon 2520 TRANSLATION Gly Ile 2470 GGG G1y*** 2420 Asn AGT ACC AAC GGA Gly ൯ End PA ORF ൯ Ile Thr GGC TAT GAG ATA 2510 2460 ൯ Glu Ser 2410 ಥ ൯ GAT ACT Thr Gly Tyr Asp 2452 2500

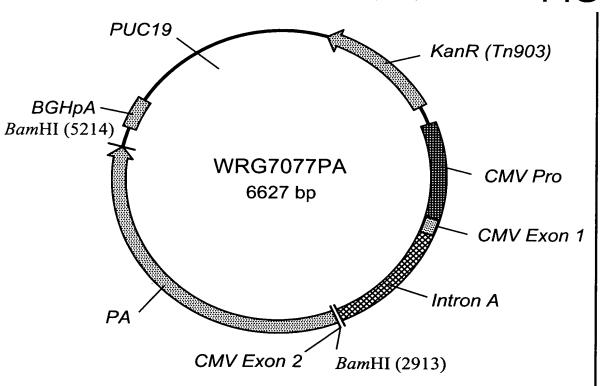
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Cys> TGT ർ Asp TGA GAT 2590 Q ** ൯ Leu ൯ ATC Ile 2580 Z ATA . Ile Ile ATC Ile 2570 TAA TRANSLATION OF ATC Ile GTA Val Thr ACA 2560 ď TAA *** ൯ Phe ൯ AGT ATG Ser Met 2550 ൯

Pro> ർ Asp GAT ಹ TAG 2600 *** α TIG Leu

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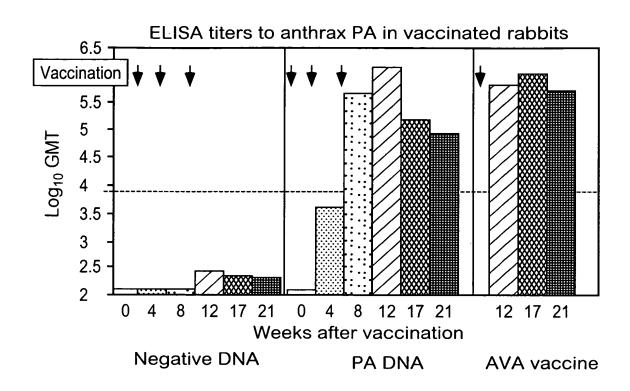


FIG. 3